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Availability of nicotine replacement therapy in substance use disorder treatment: Longitudinal patterns of adoption, sustainability, and discontinuation

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Abstract

Background—There is growing recognition regarding the clinical importance of integrating smoking cessation services, such as nicotine replacement therapy (NRT), within programs that treat substance use disorders (SUDs) since the majority of individuals receiving treatment also smoke. Previous research has not examined the organizational characteristics associated with NRT availability over time in SUD treatment programs.

Method—Using longitudinal data collected from administrators of 868 SUD treatment programs over a four-year period, the availability of NRT in the forms of the nicotine patch or nicotine gum was measured. Associations between organizational covariates and NRT adoption were estimated using multinomial logistic regression.

Results—The rate of NRT availability significantly decreased over time from 38.0% of SUD programs at baseline to 33.8% at follow-up. The multinomial logistic regression model indicated programs that sustained adoption of NRT over time were more medically-oriented, as measured by location in a hospital setting and access to physicians, and were less likely to offer outpatient services. Sustained and recent adopters of NRT were more likely to offer other smoking cessation interventions at follow-up than NRT discontinuers or NRT non-adopters.

Conclusions—These findings suggest that patients' access to NRT varies across different types of treatment organizations. Future research should continue to measure the availability of NRT and other smoking cessation interventions in SUD treatment since these services may help patients to quit smoking and reduce the likelihood of SUD relapse.

1. Introduction

Nicotine dependence is a highly prevalent co-occurring condition among individuals receiving treatment for substance use disorders (SUDs) in the United States. Between 70-80% of individuals receiving SUD treatment are smokers, which is nearly four times greater than the general adult population (Kalman et al., 2001; McCarthy et al., 2002; Richter et al., 2002; Teater and Hammond, 2010; Williams and Ziedonis, 2004). Not

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unexpectedly, the high prevalence of smoking results in increased risks of tobacco-related diseases and premature death (Hser et al., 1994; Hurt et al., 1996). Continued smoking after SUD treatment is a risk factor for SUD relapse (Lemon et al., 2003; McCarthy et al., 2002), while cessation is protective (Friend and Pagano, 2005; Satre et al., 2007; Tsoh et al., 2011). Smoking cessation is increasingly recognized as an important element of SUD treatment (Baca and Yahne, 2009; Hall and Prochaska, 2009; Kalman et al., 2010; Schroeder and Morris, 2010), but delivery of these services remains limited (Friedmann et al., 2008; Fuller et al., 2007; Jessup and Song, 2008; Knudsen and Studts, 2010; Knudsen et al., 2010; Richter et al., 2004).

Clinical practice guidelines highlight the role of nicotine replacement therapy (NRT) in promoting smoking cessation (Fiore et al., 2008; National Institute on Drug Abuse, 2000). NRT is effective in preventing relapse after an initial period of abstinence (Agboola et al., 2010) even for patients with severe nicotine dependence (Shiffman et al., 2005) or a history of alcohol use disorders (Hughes et al., 2003; Hurt et al., 1995; Kalman et al., 2006). When delivered during SUD treatment, NRT increases the likelihood of smoking abstinence (Cooney et al., 2007) and reduces cigarette consumption (Gariti et al., 2002; Reid et al., 2007; Stein et al., 2006). During SUD treatment, inclusion of NRT as a component of smoking cessation interventions increases short-term smoking abstinence, although long-term differences may not be significant (Prochaska et al., 2004).

Data on the availability of NRT in SUD programs, particularly the over-the-counter forms of the patch and gum, are sparse. Surveys have shown only 12% of opioid treatment programs (OTPs) and 11% of outpatient SUD programs offer NRT (Friedmann et al., 2008; Richter et al., 2004). It remains unclear whether low rates of adoption generalize to other types of treatment. NRT adoption may be greater in residential programs since it may help clients who are not allowed to smoke indoors (Brigham et al., 2007). When residential programs in New Jersey were mandated to become “tobacco-free,” adoption of NRT increased from 27% to 87% of agencies (Foulds et al., 2006; Williams et al., 2005).

Other organizational characteristics may be associated with NRT availability. Programs heavily dependent on reimbursement from private insurance may adopt NRT, since their patients have the resources to pay for it. Medically oriented programs, such as those in hospitals and those with physicians, may have a broader orientation towards health that is supportive of smoking cessation. Friedmann and colleague's (2008) study of outpatient treatment found greater adoption of smoking cessation medications in hospital-based programs and those with more medical staff.

Less is known about changes in NRT availability over time in SUD programs. Prior cross-sectional surveys offer snapshots about availability, but only longitudinal data can determine whether access to NRT is expanding or contracting. Data from two points in time allow programs to be categorized into a typology consisting of recent adoption, sustained adoption, discontinuation, and non-adoption. This typology has been applied to other SUD medications (Abraham et al., 2010; Knudsen et al., 2009), but not NRT.

This typology may be related to the availability of other smoking cessation interventions, such as brief interventions, counseling-based programs, and prescription medications (e.g., Zyban®, Chantix®). Innovations tend to be adopted when they are consistent with the other services offered by an organization, forming what Rogers (2003) called a “technology cluster.” Treatment programs sustaining NRT over time would likely offer other smoking cessation interventions at both baseline and follow-up. What is less clear is whether NRT discontinuation is indicative of a “trade-off,” in which programs shift from NRT to other interventions, such as varenicline which improves cessation outcomes (Gonzales et al.,

2006; Nides et al., 2006). Alternatively, NRT discontinuation may represent a broader exit from delivering smoking cessation services, but this issue has yet to be studied.

In this study, we considered three questions about NRT availability (i.e., nicotine patch or gum) within SUD treatment programs over a four-year period. First, did the availability of NRT change between baseline and the four-year follow-up interview? Second, were organizational characteristics associated with a typology of NRT adoption? Finally, was this typology associated with the availability of other smoking cessation services at follow-up?

2. Methods

2.1. Samples and Data Collection

This longitudinal study of NRT adoption in US SUD treatment programs integrate baseline and follow-up data collected during interviews with administrators of three types of SUD programs: privately funded treatment organizations (n = 403); publicly funded treatment organizations (n = 363); and therapeutic communities (TCs; n = 379). Participating programs were recruited into the National Treatment Center Study (NTCS) in 2002-2004 for face-to-face interviews; follow-up telephone interviews were conducted approximately four years later. Participants provided informed consent at both time-points. The University of Georgia's Institutional Review Board (IRB) approved the baseline and follow-up studies, while the University of Kentucky's IRB approved the follow-up study.

The NTCS samples were constructed using a two-stage random sampling strategy that sampled at the level of counties and then randomly selected programs in these counties. All three samples required programs to offer a level of SUD treatment at least equivalent to structured outpatient services (Mee-Lee et al., 1996), which excluded counselors in private practice, detoxification-only programs, and facilities that only dispensed methadone. All programs were required to be open to the general public. Privately funded programs received less than 50% of their annual operating revenues from government block grants and contracts, while publicly funded programs received at least 50% of revenues from these governmental sources. Any self-identified TC was placed in this third sample, because TCs are a unique treatment modality (DeLeon, 2000; Prendergast et al., 2000). Additional details about sample construction have been published (Knudsen et al., 2006a, 2006b). Participation rates at baseline were high (88% for private centers, 80% for public centers, and 86% for TCs).

Approximately four years later, follow-up telephone interviews were conducted about the delivery of smoking cessation services. Screening revealed that 92 facilities had closed or had ceased offering SUD treatment. Among the 1,053 organizations still open, 53 administrators (5.0%) refused to participate, and interviews were unable to be scheduled with 103 administrators (9.8%) after multiple attempts. The 897 completed interviews included 321 privately funded organizations, 299 publicly funded organizations, and 277 TCs (response rate = 85.2%). Treatment organizations received US $25 for participating in the follow-up interview.

Longitudinal research raises concerns about attrition, particularly in differences between programs participating at follow-up and those that closed, refused, or were unable to be contacted. Previous analyses of participation by structural characteristics revealed only one significant difference: smaller programs in the privately funded and TC samples were at higher risk of closure, relative to the likelihood of follow-up participation (Knudsen et al., 2010). Additional analyses of the three samples examined whether baseline measures of smoking cessation interventions (i.e., teaching smoking cessation, bupropion-SR availability, NRT availability) and access to physicians were associated with participation.

Smoking cessation interventions were not associated with the three types of non-participation. In the TC sample, access to physicians was negatively associated with the odds of closure relative to participating. These analyses suggest that participating programs were highly similar to non-respondents that were still open, but there were some differences between participating programs and those that closed.

2.2. Measures

The primary dependent variable was the availability of NRT at baseline and follow-up. At baseline, programs were asked whether they currently used the nicotine patch or nicotine gum with their patients. Affirmative responses to either type of NRT were coded "1" on the baseline measure of NRT adoption. At follow-up, program administrators were asked if the program used any medications for the treatment of nicotine dependence. Affirmative responses were followed by detailed questions about use of the nicotine patch and gum. Programs using either product were coded "1" on the follow-up measure. Using these data, an NRT adoption typology assigned each program to one of four mutually exclusive categories: sustained adopters (both time-points), recent adopters (only at follow-up), discontinuers (only at baseline), and non-adopters (neither time-point).

Organizational characteristics and other smoking cessation services were drawn from the baseline dataset. Organizational type differentiated the three samples, with publicly funded programs as the reference category. Programs were coded by ownership (1 = government-owned, 0 = privately-owned), profit status (1 = for-profit, 0 = non-profit), and location within a hospital setting (= 1; 0 = non-hospital). Available levels of care differentiated programs that only offered inpatient and/or residential services (reference category) from those providing a mixture of inpatient/residential and outpatient services or outpatient-only services. Organizational size was measured as the number of full-time equivalent (FTE) employees; a natural-log transformation corrected for skew. Access to physicians categorized programs with at least one physician on staff, at least one physician on contract (but none on staff), or no access to physicians (reference category). Use of sustained-release bupropion hydrochloride (e.g., Zyban®, Wellbutrin®; 1= adopted, 0 = not adopted) and whether the program taught smoking cessation techniques (1 = yes, 0 = no) were measured at baseline.

At follow-up, additional smoking cessation interventions were measured. Administrators indicated whether the program had adopted five brief interventions about tobacco use as part of the intake process (see Table 4). Programs were coded into those that had adopted all five guideline-recommended brief interventions (= 1; 0 = adopted < 5 brief interventions). Availability of a formal smoking cessation program consisting of individual and/or group counseling sessions dedicated to smoking cessation was measured (1 = counseling program, 0 = no program). Reports that clinicians relied on personal discretion when counseling about smoking were not accepted as an indicator of a formal program. The availability of the nicotine nasal spray, nicotine inhaler, sustained-related bupropion hydrochloride, and varenicline (i.e., Chantix®) were measured.

2.3. Data Analysis

All analyses were conducted using Stata 11.1 (StataCorp, College Station, TX). Descriptive statistics were calculated using all available cases for each variable, and McNemar's chi-square test compared baseline and follow-up rates of NRT adoption. In a preliminary analysis, logistic regression estimated the associations between the independent variables and offering NRT at baseline. Chi-square tests compared availability of other smoking cessation services at follow-up across the typology of NRT adoption; bivariate logistic regression models were used to identify pairwise differences.

Multinomial logistic regression (MLR) was used because the NRT adoption typology consisted of four mutually exclusive but unordered categories (Long, 1997; Long and Freese, 2006). MLR simultaneously estimates associations between independent variables and each outcome category, which is more efficient than separate logistic regressions for each possible binary comparison of the outcome categories (Long, 1997). This single MLR model included the seven organizational characteristics and two other smoking cessation services at baseline. Listwise deletion reduced the sample size to 835 organizations. Relative risk ratios (RRRs), calculated through the exponentiation of each coefficient, are reported. Similar to odds ratios, a RRR represents the change in odds of being a given category of the NRT typology, relative to a reference category, for a one-unit increase in an independent variable. Predicted probabilities provided additional information about the relationships between the independent variables and the NRT typology.

Recognizing that listwise deletion has known limitations (Allison, 2002), we also estimated the MLR model after imputing 20 datasets using the “ice” command (Royston, 2005a, 2005b) and pooling the MLR estimates into a single set of results using “mi estimate” (Barnard and Rubin, 1999; Royston, 2005a, 2005b). The results were highly similar to the model using listwise deletion and are available by request. Because the “mi estimate” command does not provide an indicator of overall model fit or predicted probabilities, this manuscript presents the MLR model that used listwise deletion.

3. Results

3.1. Descriptive Statistics and Preliminary Analysis

At baseline, 38.0% of SUD treatment programs offered NRT in the form of either the nicotine patch and/or nicotine gum. Approximately four years later, NRT was available in 33.8% of programs. In the 868 programs with data at both time-points, there was a modest but statistically significant decrease in NRT availability (McNemar's $\chi^2 = 5.27$, $p < .05$). As seen in Table 1, 28.3% of programs experienced changes in the availability of NRT through discontinuation or recent adoption. Other descriptive statistics appear in Table 1.

We estimated a logistic regression model of NRT availability at baseline for the 835 programs included in the longitudinal analysis. Covariates included the seven organizational characteristics and two other smoking cessation services. Five variables were significantly associated with the odds of baseline NRT adoption (likelihood ratio $\chi^2(13) = 276.40$, $p < .001$). At baseline, NRT adoption was significantly greater in hospital-based programs (odds ratio, OR = 2.82, 95% confidence interval, CI = 1.65-4.82, $p < .001$) and those requiring 12-step group attendance (OR = 1.63, 95% CI = 1.10-2.42, $p < .05$). Programs that used bupropion-SR (OR = 4.98, 95% CI = 3.44-7.21, $p < .001$) and taught smoking cessation techniques to patients (OR = 3.80, 95% CI = 2.69-5.37, $p < .001$) were more likely to offer NRT. Programs offering only outpatient treatment were less likely than those with inpatient/residential-only services to have adopted NRT at baseline (OR = .28, 95% CI = .17-.47, $p < .001$).

3.2. Multinomial Logistic Regression Model of NRT Adoption

As seen in Table 2, most independent variables were associated with at least one outcome category in the MLR model of NRT adoption. Two exceptions were ownership and profit status, which were not significantly associated with the NRT typology.

The first three columns of Table 2 present relative risk ratios (RRRs) for sustained adoption, discontinuation, or recent adoption relative to the likelihood of non-adoption. Factors positively associated with the likelihood of sustained adoption, compared to non-adoption, included being a privately funded program, location within a hospital setting, access to

physicians, and availability of other smoking cessation services at baseline. The likelihood of sustained adoption was lower in programs offering outpatient services than those that exclusively offered inpatient/residential treatment. Compared to non-adoption, the likelihood of discontinuation was significantly greater in programs located within hospitals, those that used bupropion-SR, and those that taught smoking cessation patients at baseline. These three variables were positively associated with NRT adoption at baseline; such baseline adoption meant these programs were then be "at risk" of discontinuation. The odds of recent adoption, relative to non-adoption, were also significantly greater in hospital-based programs in those using the other two smoking cessation interventions at baseline.

This model also addressed factors that differentiated discontinuation from sustained adoption. As seen in the fourth column, four variables protected against discontinuation. Specifically, being a privately funded program, being located within a hospital setting, having access to at least one staff physician, and teaching smoking cessation to patients were negatively associated with the likelihood of discontinuation relative to sustained adoption. Positive associations for offering outpatient care (either exclusively or in combination with inpatient/residential services) suggest that such programs were at greater risk of discontinuation, relative to programs that only offered inpatient/residential treatment. Interestingly, programs offering outpatient care were more likely than inpatient/residential-only programs to be recent adopters, relative to the odds of sustained adoption.

Table 3 translates the MLR results into predicted probabilities of NRT adoption. The probabilities in the first row were calculated with all dichotomous variables equal to zero (i.e., the reference category) and organizational size set at its mean. This reference row represented a publicly funded, non-profit, non-hospital treatment program of average size that was not owned by a government entity, only offered inpatient/residential treatment, did not require 12-step attendance, lacked access to physicians, and did not use other smoking cessation interventions at baseline. Under this scenario, the probability of non-adoption was very high (.75), and remaining probabilities were small.

Subsequent rows present predicted probabilities based on changing significant independent variables in the MLR model. Notable increases in sustained adoption and recent adoption occurred when a program was specified as privately funded or based in a hospital. The probability of non-adoption was greater in outpatient-only programs relative to those offering inpatient/residential-only treatment. Both smoking cessation interventions reduced the probability of non-adoption while increasing the probability of sustained adoption. However, these smoking cessation interventions also increased the probability of NRT discontinuation.

Calculating predicted probabilities for combinations of certain variables further elucidated the conditions under which sustained adoption, recent adoption, and discontinuation were maximally elevated. For example, a larger, privately owned, hospital-based treatment organization that only offered inpatient/residential treatment, had at least one physician on staff, and used both smoking cessation interventions at baseline had a predicted probability of sustained adoption of .87; probabilities of discontinuation, recent adoption, and non-adoption in this scenario were .04, .16, and .04, respectively. The predicted probability of recent adoption increased to .34 for a large therapeutic community that offered both outpatient and inpatient/residential services, had a physician on staff, and was teaching smoking cessation to patients at baseline; predicted probabilities of sustained adoption, discontinuation, and non-adoption were .12, .13, and .40, respectively. Finally, the predicted probability of discontinuation was maximized (.51) in a scenario of a large, publicly funded, hospital-based, outpatient-only program that required 12-step meetings, offered bupropion-

SR at baseline, and taught smoking cessation to patients; the probabilities of sustained adoption (.28), recent adoption (.09), and non-adoption (.11) were lower.

3.3. Availability of Other Smoking Cessation Interventions at Follow-up

Table 4 presents the availability of other smoking cessation-related interventions at follow-up across the four categories of the NRT typology. A series of bivariate logistic regression models (not shown) revealed that sustained adopters and recent adopters were consistently more likely to offer all of the other smoking cessation-related services than non-adopters. Sustained adopters were more likely than discontinuers to offer all of these services, except for the use of motivational techniques to increase willingness to quit. Differences between recent adopters and discontinuers were significant for bupropion-SR, varenicline, and the bundle of brief interventions. However, differences between recent and sustained adopters were not significant, with the exception of greater availability of bupropion-SR for sustainers. Discontinuers and non-adopters of NRT were unlikely to offer either of these medications. Adoption of the nicotine nasal spray (3.5%) and nicotine inhaler (3.3%) was so low that additional tests were not conducted due to small cell sizes.

4. Discussion

This study of nicotine replacement therapy (NRT) was one of the first to measure its availability longitudinally in a large, diverse sample of US SUD treatment programs. Although the majority of programs did not report change in NRT availability, nearly 30% reported change through discontinuation or recent adoption of NRT. However, the rate of recent adoption was not enough to offset the rate of discontinuation, as evidenced by the significantly lower availability of NRT over time.

Analyses of organizational covariates identified key factors associated with recent and sustained adoption. More medically-oriented treatment programs, such as hospital-based programs and those with access to physicians, were more likely to offer NRT. These findings are consistent with prior research conducted in a outpatient-only sample (Friedmann et al., 2008). Organizations offering outpatient services were at greater risk of non-adoption than those that only offered inpatient/residential care. The greater sustained adoption in inpatient/residential-only programs may reflect the need for programs to provide a treatment option for individuals residing in a smoke-free environment (Brigham et al., 2007).

These findings supported Rogers' (2003) argument about "technology clusters" where organizations adopt multiple innovations that are highly compatible and similar. First, we found that NRT adoption at baseline was positively correlated with concurrently offering sustained-release bupropion and teaching smoking cessation techniques to patients. The multinomial logistic regression model demonstrated that the odds of sustained adoption, relative to non-adoption, were significantly greater in programs that used these other interventions at baseline. Furthermore, teaching smoking cessation techniques to patients at baseline was protective against discontinuation, as evidenced by its negative association with the odds of discontinuation relative to the odds of sustained adoption. Finally, availability of NRT—either through recent or sustained adoption—was positively associated with availability of the other SC interventions at the follow-up interview.

These findings about smoking cessation interventions representing a "technology cluster" may have clinical implications. For example, combining NRT with sustained-release bupropion may improve clients' chances of successful smoking cessation (Croghan et al., 2007; Frishman, 2007), although some have found no added benefit (Grant et al., 2007). It is important to note that recent or sustained NRT adoption was no guarantee that programs

offered other interventions. Rates of adopting the bundle of brief interventions, counseling-based programs, and the two prescription-based medications were still modest in programs with sustained or recent adoption of NRT.

These data offered a unique opportunity to consider whether discontinuation of an innovation is associated with shifts to alternative interventions for treating the same clinical condition. For example, discontinuers of NRT could very well have transitioned to other medications or have opted to deliver counseling-based smoking cessation services. Our data do not support this notion of innovation trade-offs. Rates of offering other SC services were very low for discontinuers, suggesting NRT discontinuation largely represented an exit from delivering services for nicotine dependence.

Several limitations should be noted. While these samples include the majority of the US system, not all treatment sectors are represented. It is unknown whether these findings generalize to programs based in corrections, the VA, or opioid treatment programs. All data are self-reported, so social desirability bias is a risk. While the longitudinal measurement of NRT is a key contribution, we were unable to ask administrators why they had recently adopted or discontinued NRT because the typology was created after data collection. We could not measure whether there was an even more dynamic process of adoption and discontinuation that occurred during the years between the two interviews. Finally, our findings may be limited by potential effects of the nesting of programs within counties, attrition due to program closure, and exclusion of the 62 programs with missing data.

There is a strong need for additional research to expand knowledge about the decision-making processes related to adoption, sustainability, and discontinuation of smoking cessation interventions in SUD treatment. For example, these data were collected before the FDA's addition of the “black box warning” on bupropion and varenicline about possible adverse psychiatric reactions (Schroeder and Morris, 2010). Future studies should measure whether treatment programs opt to discontinue offering these medications to their patients.

Individuals receiving treatment for SUDs are highly likely to smoke, and many are interested in smoking cessation (Hall and Prochaska, 2009; Teater and Hammond, 2010; Toussaint et al., 2009). These findings suggest NRT availability actually decreased over a four-year period, and patients’ access to NRT was variable across different types of organizations. Perhaps most distressing is that programs that discontinued NRT rarely offered other smoking cessation interventions. However, additional research is warranted to measure the impact of recent attempts by state governments to address the co-occurrence of SUDs and nicotine dependence. Changes in public policy, such as the efforts by the New York OASAS to expand smoking cessation services (New York State Office of Alcoholism and Substance Abuse Services, 2008), may reverse the decreased availability of NRT that was documented in this research.

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Table 1

Descriptive statistics of substance use disorder (SUD) treatment program characteristics and smoking cessation services.

Variable	% (N) or Mean (SD)	Available N
Uses nicotine replacement therapy (NRT) at baseline	38.0% (333)	877
Uses NRT at follow-up	33.8% (300)	887
Typology of NRT adoption at follow-up		868
Sustained adopter	21.4% (186)	
Recent adopter	12.1% (105)	
Discontinuer	16.2% (141)	
Non-adopter	50.2% (436)	
Baseline Variables		
Organizational type		897
Publicly funded treatment centers	33.3% (299)	
Privately funded treatment centers	35.8% (321)	
Therapeutic communities	30.9% (277)	
Government-owned	11.9% (107)	897
For-profit	13.6% (122)	897
Based in a hospital	21.1% (189)	897
Levels of care		892
Inpatient/residential-only	28.7% (256)	
Mixture of inpatient/residential and outpatient	38.0% (339)	
Outpatient-only	33.3% (297)	
12-step meeting attendance is required during treatment	70.3% (630)	896
Organizational size (number of full-time equivalent employees)	34.1 (53.9)	879
Access to Physicians		878
At least one physician on staff	36.2% (318)	
At least one physician on contract	33.3% (292)	
No access to physicians	30.5% (268)	
Currently uses bupropion-SR	29.8% (262)	878
Teaches smoking cessation techniques to patients	45.0% (403)	896
Follow-up Variables		
Has adopted bundle of smoking cessation-related intake procedures	14.6% (127)	868
Offers a formal counseling-based smoking cessation program	17.1% (153)	895
Currently uses bupropion-SR	14.8% (129)	874
Currently uses varenicline	6.2% (54)	870

Note: Percentages may not sum to 100% due to rounding.

Table 2

Multinomial logistic regression model of NRT adoption typology on baseline organizational characteristics (n = 835).

Baseline Variables	Sustainers vs. Non-Adopters RRR (95% CI)	Discontinuers vs. Non-Adopters RRR (95% CI)	Recent Adopters vs. Non-Adopters RRR (95% CI)	Discontinuers vs. Sustainers RRR (95% CI)	Recent Adopters vs. Sustainers RRR (95% CI)	Recent Adopters vs. Discontinuers RRR (95% CI)
Privately funded centers (vs. publicly funded centers)	2.31* (1.17-4.56)	.95 (.47-1.92)	1.86 (.90-3.86)	.41* (.19-.89)	.81 (.34-1.89)	1.96 (.81-4.74)
Therapeutic communities (vs. publicly funded centers)	.59 (.32-1.11)	.90 (.52-1.57)	1.63 (.87-3.07)	1.52 (.77-3.01)	2.75* (1.26-6.02)	1.81 (.87-3.77)
Government-owned (vs. not government-owned)	.69 (.32-1.46)	.66 (.33-1.33)	.93 (.45-1.92)	.97 (.41-2.26)	1.35 (.54-3.35)	1.40 (.58-3.38)
For-profit (vs. non-profit)	.98 (.50-1.94)	.67 (.31-1.44)	.44 (.18-1.06)	.69 (.31-1.51)	.45 (.17-1.15)	.65 (.23-1.84)
Based in a hospital (vs. not based in a hospital)	6.41*** (3.28-12.53)	2.22* (1.03-4.79)	3.50** (1.71-7.14)	.35** (.16-.73)	.55 (.26-1.16)	1.58 (.67-3.73)
Inpatient/residential (I/R) and outpatient (vs. I/R-only)	.46** (.26-.81)	.94 (.53-1.64)	.93 (.50-1.73)	2.06* (1.09-3.89)	2.04* (1.01-4.14)	.99 (.48-2.03)
Outpatient-only (vs. I/R-only)	.13*** (.06-.25)	.48* (.25-.92)	.60 (.30-1.19)	3.78** (1.73-8.25)	4.68*** (2.02-10.83)	1.24 (.54-2.86)
12-step attendance is required (vs. not required)	1.42 (.85-2.37)	1.55 (.93-2.58)	.70 (.43-1.14)	1.09 (.61-1.93)	.49* (.27-.88)	.45* (.24-.83)
Organizational size (natural log-transformed)	1.34* (1.04-1.72)	1.27 (.99-1.64)	1.40* (1.07-1.83)	.95 (.72-1.26)	1.05 (.78-1.42)	1.10 (.80-1.51)
≥1 physician on staff (vs. no access to physicians)	2.13* (1.10-4.12)	.87 (.47-1.61)	1.24 (.66-2.35)	.41* (.20-.85)	.58 (.27-1.28)	1.43 (.66-3.09)
≥1 physician on contract (vs. no access to physicians)	2.20* (1.19-4.07)	1.15 (.67-1.95)	.95 (.52-1.73)	.52 (.26-1.03)	.43* (.20-.92)	.82 (.40-1.68)
Used bupropion-SR (vs. not used)	4.31*** (2.65-7.00)	6.80*** (4.26-10.87)	1.33 (.75-2.35)	1.58 (.96-2.61)	.31*** (.17-.56)	.20*** (.11-.36)
Taught smoking cessation to patients (vs. not taught)	5.98*** (3.77-9.48)	3.32*** (2.14-5.17)	1.89** (1.18-3.03)	.56* (.33-.93)	.32*** (.18-.55)	.57* (.33-.99)
Likelihood ratio $\chi^2(39) = 407.83$, $p<.0001$						

Notes: RRR = relative risk ratio.

* p<.05

** p<.01

*** p<.001 (two-tailed tests).

Table 3

Predicted probabilities of NRT typology by selected independent variables

	Sustained Adopters	Discontinuers	Recent Adopters	Non-Adopters
Reference probabilities	.05	.08	.12	.75
Privately funded centers	.10	.06	.20	.65
Therapeutic communities	.03	.07	.19	.72
Based in a hospital	.18	.10	.26	.45
Inpatient/residential and outpatient	.02	.07	.12	.79
Outpatient-only	.01	.04	.08	.87
12-step attendance is required	.07	.11	.08	.74
Larger program (size = 1 SD above the mean)	.06	.09	.16	.69
Smaller program (size = 1 SD below the mean)	.04	.06	.09	.81
≥1 physician on staff	.10	.06	.14	.70
≥1 physician on contract	.10	.08	.11	.71
Used bupropion-SR at baseline	.13	.31	.10	.46
Taught smoking cessation at baseline	.19	.16	.15	.49

Notes: The row of “reference probabilities” reflects all dichotomous variables set at 0 (i.e., the reference categories) and organizational size set at its mean. Each subsequent row reflects probabilities calculated for that particular independent variable with all other dichotomous variables set at 0 and organizational size set at its mean, unless otherwise noted. Reported predicted probabilities are for illustrative purposes and do not account for standard errors of the estimates. Some rows, when summed, are greater than one due to rounding.

Table 4

NRT adoption typology and adoption of other smoking cessation interventions at follow-up.

	Sustained Adopters % (N)	Recent Adopters % (N)	Discontinuers % (N)	Non-Adopters % (N)	χ^2
Brief Interventions					
Asks all new clients about tobacco use	94.6% (175)	93.2% (96)	86.4% (121)	81.2% (345)	24.50
Advises current tobacco users to quit	60.0% (111)	56.3% (58)	47.5% (66)	33.3% (143)	46.01
Assesses willingness to quit	62.7% (116)	57.3% (59)	46.7% (64)	33.4% (143)	53.12
Uses motivational techniques to increase willingness to quit	34.8% (63)	36.3% (37)	26.9% (36)	20.7% (88)	18.70
Develops a quit plan if willing to make quit attempt	51.4% (90)	49.5% (50)	35.3% (47)	25.8% (108)	44.98
Has adopted all five intake procedures	21.9% (39)	26.2% (27)	12.9% (17)	9.6% (41)	27.24
Services					
Offers counseling-based smoking cessation program	34.8% (64)	27.6% (29)	18.4% (26)	7.3% (32)	76.99
Uses bupropion-SR	46.6% (83)	32.4% (33)	3.6% (5)	1.2% (5)	247.49
Uses varenicline	14.8% (26)	21.8% (22)	2.1% (3)	0.7% (3)	89.20

Notes: The percentage and N represents the organizations reporting “yes” for that measure. The use of available data for each chi-square test produces fluctuating sample sizes ranging from 827 to 866 treatment organizations. All chi-square tests have 3 degrees of freedom and are statistically significant at $p < .001$.